

**REMARKS/ARGUMENTS**

Applicants have amended independent Claims 1, 3, and 5 in order to more clearly define the present invention and remove any ambiguity that may have existed as relates to the multifunction electromagnetic coil being a single coil. New Claims 10, 11, and 12 have been added to further clarify that more than one of the multifunction coils could be used in situations where the work piece undergoing electromagnetic treatment is a large work piece, thereby necessitating using one or more of the multifunction coils. Previously non-elected Claims 7, 8, and 9 have been deleted. However, Applicants reserve the right to file Divisional applications on the non-elected subject matter.

**Double Patenting Rejection**

The Examiner has provisionally rejected Claims 1-6 of the instant application on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1-3 of copending application serial number 10/498,239 (hereinafter copending application '239). Applicants respectfully disagree.

Claims 1-6 of the present application are generally directed towards an apparatus for electromagnetic treatment of a metallurgical work piece. In contrast, Claims 1-3 of the cited copending application '239 are generally directed towards an apparatus for simulation and analysis of industrial processes. Applicants note the Examiner's observation that the "conflicting claims are not identical" along with the Examiner's assertion that these claims are not patentably distinct. Applicants respectfully submit that the Examiner has overlooked some basic differences between the two inventions that clearly render these claims patentably distinct from one another. In particular, Claims 1-3 of cited copending application '239 pertain to simulation and analysis of the heating and cooling of a test sample without any requirement of electromagnetic treatment. In contrast, Claims 1-6 of the present application are limited to electromagnetic treatment on a processed work piece by way of a single electromagnetic coil. Accordingly, Applicants submit that the instant rejection should be withdrawn. Should the Examiner feel otherwise, he is urged to contact the undersigned by telephone concerning the applicability of a terminal disclaimer.

**Rejection of Claims 1-6 under 35 USC § 103(a) based on Vives in view of either Mucha et al. or Simcock**

The Examiner has rejected Claims 1-6 in view of Vives (U.S. Patent No. RE32,529) in view, alternatively, of either Mucha et al. (U.S. Patent No. 4,897,518) or Simcock (U.S. Patent No. 4,927,460). Applicants respectfully disagree.

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending therefrom is non-obvious. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

More specifically, three criteria must be considered in order for an Examiner to establish a prima facie case of obviousness: (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings, (2) there must be a reasonable expectation of success, and (3) the prior art references must teach or suggest all of the claim limitations. MPEP §§ 706.02(j), 2142 (8th ed.). Applicants respectfully submit that the instant rejection fails on all three criteria.

For the USPTO to combine references in an obviousness analysis, the USPTO must do two things. First, the USPTO must articulate a motivation to combine the references, and second, the USPTO must support the articulated motivation with actual evidence. In re Dembicza, 175 F.3d 994,999 (Fed. Cir. 1999). While the range of sources for the motivation is broad, the range of available sources does not diminish the requirement for actual evidence. *Id.*

Based upon the above, Applicants submit that the proposed combination cannot be justified for at least the following reasons. Firstly, the primary reference to Vives fails to show or fairly suggest a single electromagnetic coil. Indeed, col. 2, lines 10-14 of Vives clearly delineate

using a stationary with a related DC coil (see at least col. 2, lines 15-23 and description of Figure 2 at col. 3, lines 57-64) and a variable field with a related AC coil (see at least col. 2, lines 33-38 and description of Figure 2 at col. 3, lines 57-64). Further, Claim 7 of clear evidence of the metes and bounds of the Vives reference in that two coils are distinctly claimed. Clearly, a requirement of the Vives device is that there are necessarily two different coils required.

Applicants submit that such complexities require Vives to have two related power supplies corresponding to the two separate (stationary and variable) coils. In contrast, the present invention includes a single multifunction electromagnetic coil that serves as a means for generating an AC component having harmonic shapes, imposing a DC component with a constant bias on the AC current, and varies the frequency of the AC current component. Such is clearly claimed within Claims 2, 4, and 6 along with being supported by at least paragraph [0064] of the Specification as originally filed.

Applicants have amended each independent Claim 1, 3, and 5 and added new Claims 10, 11, and 12 to more clearly state the nature of when more than one coil would be useful in regards to the instant invention. Although only a single electromagnetic coil of the present invention is required, the size of the work piece may in fact dictate that more than one coil, perhaps of more than one shape, be used to adequately treat that larger work piece. Clearly, Figure 1 and the original Specification in at least paragraph [0061] show that the power supply is connected to one multifunction coil. It is Applicant's controlled current/voltage source as discussed in paragraph [0064] that serves to provide a multifunctionality to the coil. At least paragraph [0048] along with the original claims, make it clear that more than one multifunction coil may be used. However, each coil itself provides the AC and DC component and related fields upon the work piece by way of the controlled current/voltage source. This is very different from the apparatus as shown by Vives. Indeed, nothing within the Vives reference shows or suggests the elegant solution provided by Applicants' claimed invention.

Further, neither the Mucha et al. nor Simcock references provide any motivation or suggestion whatsoever to modify the apparatus of Vives so as to arrive at Applicants' claimed invention.

Specifically, the Mucha et al. reference is a method of monitoring an induction heating cycle that applies to induction heating systems for the heat treatment of iron or steel or other alloys for components like camshafts. Induction heat treatment is performed in the solid state thanks to various metallurgical reactions allowing for control of the structure and mechanical properties of the treated work piece. Moreover, col. 4, lines 7-9 detail that “[t]he work piece within the inductor is inductively heated for tempering, subsequent quench hardening, etc.” Applicants respectfully submit that these operations are not associated with metal casting operations like liquid melt treatment. The shape of the work piece prior to the solid state heat treatment is formed using many techniques (i.e., stamping), while the present invention is utilized for melt treatment prior to or during the casting operation(s). The present invention generally deals with the liquid and/or semi-liquid state treatment of metal(s), alloy(s) and metal matrix composites. It should be noted that different physical phenomena govern heat treatment of the solid component in comparison with the melt treatment leading to improved as-cast structures and allowing for better controlled heat treated cast component characteristics. Therefore, the solid state heat treatment of Mucha et al. and the melt treatment are two different and clearly divergent technological operations. As such, Mucha et al. teaches away from the present invention and is therefore inapplicable to the instant claims. Even if combined with the Vives reference, Mucha et al. fails to remove the defects discussed above that render the Vives reference inapplicable to the instant claims. Accordingly, the combination of Vives with Mucha et al. fails to show or fairly suggest the present invention as claimed.

Still further, the Simcock reference is directed to a method and apparatus for providing agitation of the melt in the induction melting of metals. Liquid melts containing many alloying and impurity elements have the tendency to stratification during extended processing times or under unfavorable melting and holding conditions. Melt stratification could result in significant variation of chemical, thermal, structural and mechanical characteristics of the cast components using the same melt batch. The metallurgical community has understood (for a very long time) that the high quality of the melt in terms of its chemical homogeneity can be obtained by liquid melt agitation or stirring (using mechanical, electromagnetic, and other means). Melt homogenization as described in Simcock is not intended for, nor capable of, changing the as-cast structures as in the present invention which simultaneously stirs and vibrates the liquid and/or the semi-solid melt. Moreover, Simcock’s melting furnace and

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stirring method and apparatus do not have any metallurgical and/or electrical similarities to the present invention. Still further, the metallurgical output of Simcock is completely different from that of the Applicants. As such, Simcock is also believed to teach away from the present invention and is therefore inapplicable to the instant claims. Even if combined with the Vives reference, Simcock fails to remove the defects discussed above that render the Vives reference inapplicable to the instant claims. Accordingly, the combination of Vives with Simcock fails to show or fairly suggest the present invention as claimed.

Applicants therefore respectfully submit that the above discussion militates in favor of the present invention for its non-obviousness. Accordingly, the rejection under §103 (a) should be withdrawn.

### **Conclusion**

Applicants respectfully submit that Claims 1 through 6 and 10 through 12 are not shown or fairly suggested by the cited references taken alone or in any combination. Accordingly, the outstanding rejections should be withdrawn.

No additional fee is believed due for this submission. However, Applicant authorizes the Commissioner to debit any required fee from **Deposit Account No. 503807**, in the name of Dennis R. Haszko. The Commissioner is further authorized to debit any additional amount required, and to credit any overpayment to the above-noted deposit account.

Applicant has amended the claims of this application so that they are proper, definite, and defines novel structure which is also non-obvious. If, for any reason this application is not believed to be in full condition for allowance, Applicant respectfully requests that the Examiner contact the undersigned representative at (207) 615-0424 and hereby solicits the constructive assistance and suggestions of the Examiner pursuant to MPEP § 2173.02 in order that the undersigned can place this application in allowable conditions as soon as possible and without the need for further proceedings and related cost to the Applicants.

It is submitted that this application is now in condition for allowance, and action to that end is respectfully requested.

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Respectfully submitted,

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